

UNITED STATES
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SOURCE AND SIGNIFICANCE OF MINERAL CONSTITUENTS IN NATURAL WATERS.

The mineral constituents of natural waters here considered include all that are found in normal waters in quantities sufficient to have any practical effect on the value of the waters for ordinary uses.

Silica (SiO_2) is dissolved from practically all rocks. A few natural waters contain as little as 3 parts per million of silica and some contain more than 50 parts, but most of them contain from 10 to 30 parts per million. Silica does not affect the usefulness of a water except as it contributes to the formation of boiler scale.

Iron (Fe) is dissolved from many rock materials and may be dissolved from water pipes in quantities so large as to be objectionable. On exposure to the air water that contains more than 1 part per million of iron soon becomes turbid with the insoluble compound produced by oxidation; surface waters therefore rarely contain as much as 1 part per million of dissolved iron. Many ground waters contain 2 or 3 parts per million and some even 10 parts or more. Excessive iron in water causes stains on white porcelain or enameled ware and fixtures and on clothing or other fabrics washed in the water.

Calcium (Ca) is dissolved from practically all rocks, but particularly from limestone, dolomite, and gypsum. Calcium and magnesium make water hard and are the active agents in forming boiler scale. Most waters from granite contain less than 10 parts per million of calcium; many waters from limestone contain from 30 to 70 parts; and waters that leach deposits of gypsum may contain more than 100.

Magnesium (Mg) is dissolved from many rocks but particularly from dolomite. Its effects are similar to those of calcium, but waters that contain much magnesium and chloride are likely to be corrosive, especially in steam boilers. The magnesium in soft waters may amount to only 1 or 2 parts per million, but the surface or ground water in areas that contain large quantities of dolomite may contain 20 to 50 parts per million of magnesium.

Sodium and potassium (Na + K) are dissolved from practically all rocks, but they make up only a small part of the dissolved mineral matter in most waters in humid regions. The waters of many deep wells are strong solutions of common salt (sodium chloride) and contain smaller quantities of other soluble salts; some waters in arid and semiarid regions contain large quantities of sodium sulphate and carbonate. Sodium and potassium are generally not sep-